ON AN EGG-PARASITE OF THE CURRANT SAW FLY (*NEMATUS VENTRICOSUS*).

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Dr. Asa Fitch, in his 12th Annual report on the insects of New York for the year 1867 (Trans. N. Y. state agric. soc. for 1867, 1868. v. 27), p. 931-932, made the following reference to this insect:

"As none of the foreign accounts which we have seen allude to any parasitic enemy of this currant saw-fly, it seemed quite improbable that it would in this country meet with any such enemy, to lighten from us the task of combatting it and diminishing its devastations. But our valued friend J. A. Lintner, of Schoharie, greets us with the glad tidings that he has discovered we have such a foe to this formidable scourge. An egg parasite of this saw-fly inhabits our state, an exceedingly minute hymenopterous insect, which inserts its eggs into those of the saw-fly, that its young may subsist upon and consume the contents of those eggs. This diminutive little fly has probably existed hitherto upon the eggs of some one of our American saw-flies similar in size to those of the currant saw-fly; and it has now discovered that the eggs of this newly arrived foreigner are equally well adapted to its wants. And so multiplied has this little friend of the gardener become, that in Utica Mr. Lintner finds that among fifty eggs of a saw-fly upon a currant leaf, there will not be more than four or five that will hatch currant worms, all the rest being occupied by the little maggot, the young of this parasite. At Schoharie, also, where the saw-fly has arrived more recently than at Utica, he finds this parasite is now beginning to appear. Everywhere this little creature is no doubt following upon the tracks of the saw-fly, and within a very few years after the one arrives in any place the other will be there also, and will speedily become so multiplied as to quell and extinguish it. This is a most important discovery, and renders it quite probable that in this country this currant worm can never be but a temporary evil. Whenever circumstances favor it and enable it to multiply and become numerous in any section of our country, this little enemy, its mortal foe, will speedily be there to subdue and stamp it down. Thus nicely are the works of nature balanced, and no creature is permitted to usurp a place in her domain which does not belong to it."

The specimens of the parasite obtained by me, at the time referred to in the above notice, were submitted to a friend who had made study of the group to which they belong, who believed them to be an undescribed species, and was only able to give them a doubtful generic reference. They were subsequently destroyed, and from that time until the present year (an interval of fourteen years), although I have con-

tinued to search for them, I have been unable to obtain the species.

Its rediscovery by me the present year, and the determination of the species, lend additional interest to the notes upon it that I made at its first observation, at Utica, N. Y., in June 1866, and I therefore transcribe them from my note-book :—

I had collected a number of currant leaves upon which the currant saw-fly had deposited eggs, and was counting the eggs upon each to obtain the average number per leaf, when I noticed an occasional brown egg among them, appearing somewhat abnormal in shape. On placing them under a lens a resemblance to a pupal form was detected. I at once suspected the presence of the parasite for which we had been hoping. Although there seemed to be but the merest chance of discovering at large an insect so minute as this must necessarily be, I instituted a careful search of the currant bushes in the garden, and in a short time had the great gratification of discovering a minute speck moving among the eggs, which under my lens revealed a form which left scarce room for doubt of its parasitic character. During the day I detected several more of the kind upon the leaves containing egg-deposits, affording strong evidence of their relationship. A few days thereafter (perhaps a week), in a small phial in which I had placed some eggs that I suspected of having been parasitized, I had the delight of seeing several of the familiar forms of my currant-leaf acquaintances, and the ruptured pupa cases from which they had evidently escaped.

The following year (1867) there was a marked diminution in the number of currant-worms observed, and a corresponding increase in parasitized eggs. Many of the leaves had not been visited by the parasite, but of those that gave evidence of such visit, the work of destruction was almost complete, for of several leaves bearing each from thirty to forty eggs, all but five or six were transformed into parasitic pupae.

In June 1868, I was able to make, at Schoharie, N. Y., the following observations upon the oviposition of the parasite within the eggs of the currant saw-fly :—

In a small phial in which had been placed some parasitized eggs of the saw-fly, a male and female parasite had emerged. That I might observe their actions I introduced a piece of currant leaf having upon it some eggs which I had just seen deposited. No evidence was given that the female was aware of the presence of the eggs, but after several minutes traveling around the glass, she moved upon the leaf, and in passing over and beneath it, seemed to meet with them accidentally. She paused, and then began a careful inspection, walking over them several times, and constantly palpating them with her antennae. Then, satisfied with her examination, she attached herself to one of the eggs, appressed the tip of her abdomen to it, and remained in this

position motionless for the space of two-and-a-half minutes, during which time an egg, doubtless, was inserted, although the pocket lens with which the observation was made did not disclose the fact. The motion of her antennae then recommenced, and I expected to see the operation just witnessed repeated upon another egg; but, to my surprise, she merely changed position—again applied the tip of her abdomen to a different part of the same egg, and remained at rest for about the same space of time as before. Three times I witnessed this performance, and it is therefore probable that three parasitic eggs were placed within the one of the currant-fly. Unfortunately an interruption prevented me from noticing if the remaining currant-fly eggs were similarly parasitized, and the number of eggs introduced in each; and much to my regret, the eggs were accidentally destroyed before my observations could be made upon their transmutation into parasitic pupae. The pupa cases are dark brown, disclosing some of the outlines of the contained pupae, somewhat flattened, broader than the original egg, but of about its length. The insect is apparently one of the *chalcididae*, having a broad head, long and elbowed antennae, ovoid anterior wings, nearly veinless, beautifully iridescent, delicately fringed and haired; the posterior wings are almost linear; the abdomen is short, not reaching the tips of the wings.

This year (1868) is probably the first appearance of the parasite at Schoharie, as I could only discover about a dozen individuals. Its progress seems to be from west to east, corresponding with that of the currant-worm.

The rediscovery of the parasite the present year (1882) was made in my garden at Albany, upon a solitary currant bush growing there. The parasitized eggs were enclosed in a bottle, and in a few days the insects emerged. That I might multiply and aid in the distribution of an insect which had already shown its capability for usefulness, I visited another garden in the city to obtain eggs of the currant-fly for parasitization by my confined individuals. To my surprise, the parasite was here found in strong force, for in the examination of a long row of currant bushes containing many eggs, I could not find a single egg-bearing leaf which had not been visited, and the destruction of the eggs ensured. A large number of leaves were collected, each bearing perhaps from forty to fifty parasitized eggs. Reserving a few of these for study and for propagation, the remainder were made up in small parcels of about a half-dozen each, and mailed to entomological friends in various parts of the United States and Canada, with the request that they be pinned upon currant-bushes among the leaves where the currant-fly eggs were to be found. The introduction of parasites in this manner into localities where they had not previously occurred, has been shown to be practicable; and in consideration of the great importance of parasitic aid in the destruction of our

insect pests. I sincerely hope that my efforts to distribute this very efficient parasite may prove, from observations to be made hereafter, to have been successful.

Examples of the insect were sent by me to Mr. L. O. Howard, of the Department of agriculture at Washington, a gentleman who has made special study of the family to which it pertains, viz., the *chalcididae*. He informs me that there is no doubt of its being the species described and named by Dr. C. V. Riley in 1879 (Can. entom., Sept. 1879 v. 11, p. 161-162) as *Trichogramma pretiosa*, examples of which had been reared, at Washington, from eggs of the cotton-worm moth, *Aletia argillacea* Hübn., collected in Alabama. The description is reproduced, with additional information, in Prof. J. H. Comstock's Report upon cotton insects (Washington, 1879), p. 193. It has since been extensively reared from eggs of the same moth collected in Florida, by Mr. H. G. Hubbard. It has also been bred at the U. S. Department of agriculture from eggs of an unknown noctuid moth occurring on orange trees, and from *Aleyrodes*.

Dr. Riley, from some structural features, thought that it might be necessary to establish a new genus for this species and one or two closely allied ones, but Mr. Howard finds it to be a true *Trichogramma*, as at first referred.

Another species of the genus, *T. minuta* Riley,[1] has been reared from the eggs of one of our common butterflies, of extensive distribution, *Limenitis disippus*. Parasitized examples of these eggs have given from four to six specimens of the minute creature, which, notwithstanding its specific name of *minuta*, exceeds in size the microscopic *T. pretiosa*, the latter being only about 0.25 mm. in length.

In connection with the above notice of the egg-parasite of the currant-fly, it may be of interest to offer the following note of the oviposition of the currant-fly as observed by me, as its method has not to my knowledge been previously published:

June 7, 1868. *Nematus ventricosus* was seen to deposit thirty eggs upon a single currant leaf within one hour. In the act of ovipositing, it curved the tip of its abdomen downward and forward, directing its ovipositor toward its head, in which position the end of the egg is seen to protrude and attach itself to the leaf-nervure, when the ovipositor is withdrawn, and the egg left in position. Moving backward a very little, another egg is similarly deposited, and in like manner the operation is continued, until the leaf has its assigned quota, or the supply of eggs is exhausted. The eggs produced their larvae on June 14th.

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1 *Third Annual report on the insects of Missouri*, 1871, p. 158, fig. 72.